Effect of Meditation & Physical Activity (MAP) Training on Cognitive Flexibility, Insight Problem Solving & Academic Achievement of Primary School Students

A

Synopsis

Submitted to

Dayalbagh Educational Institute

(Deemed University)

For the Partial Fulfillment of

the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

[2018]

Supervisor

Dr. Sona Ahuja

Associate Professor

Researcher

DikshaYadav

Head of the Department

Department of Pedagogical Sciences

Dean

Faculty of Education

FACULTY OF EDUCATION

DAYALBAGH EDUCATIONAL INSTITUTE

DAYALBAGH, AGRA

1.0 Introduction

It is believed that childhood is a carefree time. It is a myth as the fact is that a child experience many fears i.e fear of dark, fear of abandonment, fear of teacher, fear of not being good enough etc (Alves, 2013). These fears always affect the way of learning things and the child may not be able give his whole attention to the present moment in which he is living.

In educational institutions the curriculum is designed in such a way that it may cater to the needs and demands of students in all sense so that the goal of overall personality development can be achieved. In present time the focus of educational institutions is to make students academically sound and active. The focus of these prevailing institutions is on training students about the ways through which they can learn more and more and achieve heights of academic success. Although there is provision of games and sports period but that is not enough to bring out a complete positive change as the students are not being freed from their fears. Educational institutions lays emphasis on mental training of students only through academic activities quizzes, discussions etc. but these activities do not help in providing mental peace to students. Meditation is a proven means for silencing the mind, encouraging mindfulness and providing optimum conditions for generative thinking and reflection (Fisher R, 2006). Meditation has been shown to be associated with alterations in brain structure (Cahn & Polich, 2006) better mental health (Chiesa & Serretti, 2009), improved attention (Jha, Krompinger & Baime, 2007), greater emotional self-regulation (Goldin & Gross, 2010), slower cellular aging (Jacobs et. al., 2011) and better academic performance (Nidich et. al.,2011). It helps in improving mental strength, building confidence, releasing negative thoughts and behavior. These aspects build a foundation for a healthy mind which leads to improved academic performance in schools.

1.1 Meditation

The term ‘meditation’ refers to an extremely wide variety of practices. The central goal of these meditation practices is to voluntarily alter mental states and traits (Bosch, 2011). However, the manner in which this goal is pursued in the variety of practices differs enough from each other so that as of today no clear definition of necessary and sufficient criteria for meditation exists that has achieved universal or widespread acceptance. For instance, the focusing of attention on the breath, the recitation of a mantra, the visualization of ‘energy’ or a divine being and the cultivation of a compassionate state can all be counted as meditation. In later years some of the researchers tried to define meditation on the basis of its effect on mind. Meditation is defined as the control of fluctuations of the mind that aim to still the fluctuations (patterning) of the mind. When the fluctuations of the mind are controlled, the yogi achieves concentration”(Barentsen et al., 2010).

It is not easy to trace the history of meditation but as per the reports its origin lies from three millennium BC, India at Indus valley civilization. Meditation practices were propounded in eastern culture for the first time (Buckley & Walthall, 2013). As per eastern philosophies it is regarded as those techniques and practices which guide an individual to experience higher state of consciousness (“Altered state of consciousness”,n.d.). Originally meditation practices were largely aimed at spiritual enlightenment which focuses on alleviation of suffering. Gradually these practices passes through every culture and people experienced various positive effects of these practices in their lifestyle. With the rise of materialism in early 18^{th} century meditation became popular in western world. In western point of view these practices were viewed as a means to attain mental peace. Western contemplative practices have largely been influenced by eastern philosophy. It has gained valid attention and acceptance of researchers due to its proven benefits for the mind. There has been widespread and growing use of meditative practices in clinical and research settings (Kristeller & Rikhye, 2008; Sedlmeier et al., 2012; Shapiro & Walsh, 2003). Within the attention paradigm, meditation can be classified into two broad categories i.e focused attention meditation

(FA) and open monitoring meditation (OM) (Lutz et al., 2008). In a broad sense eastern concept of meditation gives importance to focused attention meditation techniques i.e mantra meditation, chakra meditation, zazen meditation, vipasssana meditation etc (Moss et al.,2012). Western concept of meditation views it as a relaxation technique for the mind. It gives importance to mindfulness meditation which is now at its peak in the area of research.

1.2 Chakra Meditation

Chakras were first described in the Hindu Scriptures (The Vedas) thousands of years ago, and literally means wheels of energy**.** They predominantly deal with energy flow in the body and are said to be focused areas (or vortices) of high, expansive energy, within multiple locations in the body. As per Tantrik traditions, chakras (Skt. *cakra*) are focal points for meditation within the human body, visualized as structures of energy resembling discs or flowers at those points where a number of nadis (channels or meridians) converge (wallis,2016). Each chakra is associated with a specific Great Element (Earth, Water, Fire, Wind, and Space). Each chakra is associated with a specific Hindu deity or deities and its function is to act as a template for *nyasa*. In nyāsa (lit., 'placing'), i.e one visualize a specific syllable in a specific location in a specific chakra in your energy body while silently intoning its sound (Wallis, 2016). According to oriental philosophy of saints syllable based meditation helps in balancing the specific energy centers in the body and eventually leads to provide joy and bliss to the mind of person (Misra, 2009). The universe has divided life force energy to the earth and to our organs located throughout the body. It is believed that balance of this life force energy results in achievement of optimum well being and health. Thus chakra meditation act as a guiding force for balancing the energy centers of the body ("Chakra meditation", n.d.).

1.3 Mantra Meditation

Mantra meditation employs the use of a mentally repeated word or phrase, with the objective of maintaining attention on that specific object. As such, mantra meditation may be considered to be more of a focused attention style of practice (Lutz, Brefczynski, Johnstone & Davidson, 2008). The term *mantra* comes from Sanskrit and means instrument of thought, and sacred text (Monier, Leumann, Cappeller, 2000). The phrase *"Om Mani Padme Hum"* is a classic Tibetan Buddhist mantra. Use of mantra is found in many Eastern traditions, including Tibetan and Pure Land Buddhism, Hinduism, Sikhism, and Jainism (Burke, Nok Lam, Stussman & Yang, 2017). Transcendental meditation is a popular mantra style that employs traditional Sanskrit words. The Relaxation Response uses mental repetition of the English language word "one." Some spiritual meditation practices may also employ silent repetition of a religious word or phrase. Mantra meditation is considered to be one of the most focused form of meditation and it is reported that it has calming effect on the brain of the child (Burke, Lam, Stussman & Yang, 2015). The Gayatri mantra (GM) has been mentioned in the Rig Veda. The GM was revealed to the sage Vishwamitra. It is also called Savitṛ mantra since it concerns the deity Savitṛ i.e Sun (Harshananda & Ramkrishna Math, 2010). According to the Indian tradition, GM initiated to a student before starting his/her formal education. It is said that chanting this mantra will bring the improvement in the *dhī śakti* i.e. the power of intellect (Bhatta, 2004).

1.4 Physical Activity Training

Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure (Caspersen CJ,1985). Physical inactivity has become an emerging issue among children as they are more active on digital platforms rather being physically active. These changes have occurred due to technological advancement and changing societal structure. These changes are leading to various health issues like increase in the prevalence of obesity and other chronic diseases (Strong, Malina & Blimkie, 2005). The Institute of Medicine has called on school leaders to offer

more opportunities for children to be physically active before, during and after the school day (National Academy of Sciences, 2013). Several studies reported that Physical activity can have both immediate and long-term benefits on academic performance and brain health. In a review of 39 studies on the mental and intellectual benefits associated with school-based physical activity programs found that the greatest effects were seen when children engaged in aerobic physical activity, like jogging in place, rather than resistance activities, like push-ups or sit-ups (Fedewa & Ahn, 2011). It is reported that even after one session of physical activity, children can increase their attention and memory, and reduce inappropriate behavior, such as being unfocused and causing others to become distracted (Tomporowski, 2003). Through several studies it was concluded that Children participating in physical activity are better able to stay focused and remain on task in the classroom, thus enhancing the learning experience. As children spend some hours at school hence there is a scope for helping children to become more healthy and active by involving certain kind of physical activities in between academic sessions. However there are very few studies which have investigated the effect of physical activity on brain health of children. Most of the researches have targeted only older children. Thus there is a need to examine the effect of physical activity on young children as early childhood lays the foundation of a healthy adulthood. Hence physical training plays an important role and children must be trained in their early years.

1.5 MAP (Meditation & Physical Activity) Training

MAP is a new brain health program which is designed by neuroscientist Dr. Tracey Shors to maximize brain health by exercising brain and the body at the same time. It includes mental training which is carried out through meditation and physical training which is carried out through physical activities like- aerobics, stretching exercises simple yoga positions etc. In this training the purpose of meditation is to train the brain with new learning so that the mind. It trains one’s mind to be in the present moment and letting go of all other thoughts.

In this training meditation act as cleansing force for the mind as it helps in relieving the mind from unnecessary thoughts and helps to remain more focused. Physical training includes simple physical activities and aerobics which is good for the brain as it increases blood flow and growth of new blood vessels (Shors, Chang, Millon, 2018). Till now this intervention has become successful and yields positive results in the field of neuroscience. It was reported that MAP training decreases symptoms of depression and rumination in both healthy and depressed young adults (Alderman et al., 2016). It was also reported that MAP training helps in decreasing anxiety and boosting oxygen consumption in mothers with trauma history (Shors et al., 2014). Positive effects of MAP training were also seen on women dealing with sexual trauma (Shors et al., 2018).

1.6 Cognitive Flexibility

Cognitive flexibility is the ability to appropriately adjust one's behavior according to a changing environment (Armbruster DJN, et al.,2012). Cognitive flexibility enables an individual to work efficiently to disengage from a previous task, reconfigure a new response set, and implement this new response set to the task at hand. Greater cognitive flexibility is associated with favorable outcomes throughout the lifespan such as better reading abilities in childhood (de Abreu PME, et al.,2014) higher resilience to negative life events and stress in adulthood (Genet JJ, Siemer M,2011), higher levels of creativity in adulthood (Chen Q, et al.,2014), and better quality of life in older individuals (Davis et. al., 2010). Cognitive flexibility is a construct that is an emergent property of efficient executive function (EF) and is typically measured in the laboratory using set shifting or task switching behavioral paradigms. A task can be defined as trials with one set of instructions that govern successful completion. In task switching, participants must switch between tasks with different instructions given some stimuli (Monsell S., 2003, Armbruster DJN, et al., 2012).

In simple terms cognitive flexibility refers to the awareness of a person when he or she is aware about alternative ways and being ready in accommodating to new situations. In recent years

scientific interest in the area of meditation has grown exponentially. Meditation is considered to be one of the best measures for improving cognitive flexibility. Meditation is the silent art of awareness and observation. By bringing the activity of the mind into proper alignment it helps in relaxing it and makes one more stable. As our daily life deals with number of different and unexpected events which require a flexible approach to deal with the problems that needs to be solved. A person having high cognitive flexibility will be able to switch his attentional processes and will be able to solve problems not only on the basis of analytics but also on the basis of insight.

1.7 Insight Problem Solving

The problem of insight took its place among the perennial problems of cognitive psychology when Wolfgang Kohler observed a chimpanzee, Sultan, secure a high-slung banana snack with the help of a long bamboo stick constructed by joining two shorter sticks (Kohler, 1921). According to Kohler, Sultan solved the problem suddenly, after sulking a while over his previous, failed, attempts to reach the bananas. This observation prompted Kohler and other Gestalt psychologists to launch an extended programme of research on what they called the Aha- experience or insight (Duncker, 1935; Koffka, 1935; Wertheimer,1959).

There is no specific theoretical definition of insight problem solving ability till date. There is a definition given by Wittgenstein which shed light upon the defining characteristics of insight problems and the way it can solved. They are posed in such a way that there can be several possible problem representations, each with an associated solution search space. Likely initial representations are inadequate as they fail to allow the possibility of discovering a problem solution. In order to overcome such a failure, it is necessary to find an alternative productive representation of the problem (out of the box thinking). Finding a productive problem representation may be facilitated by a period of non-solving activity called incubation, and also it may be potentiated by well-chosen hints. Once obtained, a productive representation leads quite directly and quickly to a solution. The solution involves the use of knowledge that is well known to the solver. Once the

solution is obtained, it is accompanied by a so-called “aha!” experience. When a solution is revealed to a non-solver, it is grasped quickly, often with a feeling of surprise at its simplicity, akin to an “aha!” experience (Wittgenstein, 1958).

There is an increasing amount of literature suggesting that the researches on meditation is going on in almost every field including physiological, psychiatrical, and psychological conditions (e.g., anxiety, depression, quality of life, mental health) or a general medical condition (Ospina et al., 2007). Another subject of research is the effect of meditation techniques on cognition and neuropsychological functions. It is reported that various types of mindfulness meditation seem to positively influence cognitive functions. The effects of aerobic physical activity (APA) on children’s physical health is well characterized, the effect of aerobic physical activity on cognition, academic achievement, and psychosocial function is still in progress (Lees & Hopkins, 2013).

Thus the question arises that what will be the effect if these two meditation and physical activity training practices get combined within an educational institution? Whether these practices separately yield better results or proven to be better when combined? Thus this study will throw light upon effect of MAP on cognitive flexibility, insightful problem solving ability and academic achievement of primary school students.

2.0 Emergence & Justification of the Problem

Our daily life is full of changes like a change of plan, an unannounced event, an unexpected problem that needs to be solved, a new environment or a surprise sudden opportunity. These changes calls upon flexibility i.e one needs to abandon the current direction and adjust one’s thoughts or behavior to the new situation. Flexibility is therefore essential for social and goal directed behavior. This flexibility of mind is very essential for solving problems that a child may face in everyday life.

Eg- In a classroom setting a child has to deal with different subjects during different time intervals. This demands a sort of set shifting/flexibility of mind. So that the child can accommodate himself/herself in accordance to the subject demands and will be able to solve problems.

Cognitive flexibility is considered to be the determinant of language domain (Kroesbergen, Boom & Leseman, 2012). Cognitive flexibility is described as the ability to refocus attention to relevant stimuli (Diamond, 2006) and also simultaneously consider conflicting representations of information in order to execute goal directed behavior (Jacques & Zelazo, 2005). In the context of higher order cognitive abilities, other than cognitive flexibility there is one more important ability responsible for problem solving is insight. Insight is the abrupt realization of a problem's solution. It is a completely cognitive experience that requires the ability to visualize the problem and the solution internally - in the mind's eye, so to speak - before initiating a behavioral response. In day to day life the child deals with many problems where the solution may be reached via rote, routine, incremental, or analytic solution processes. However, in some cases progress of solution relies on more insightful means which involves intuitive, creative, non-incremental, or discontinuous solution processes (Ash, Cushen & Wiley,2009). This situation occurs when the problem-solver has been stuck for some time. If a solution proceeds smoothly from start to finish, with a constant rate of progress throughout, then we do not call it an insight solution. This stage of insight problem solving occurs after the person has encountered an impasse, i.e., a mental state in which problem solving has come to a halt; all possibilities seem to have been exhausted and the person cannot think of anyway to proceed. This ability also demands certain kind of flexibility of mind as it involves cognitive processes.

Hence these abilities need to be developed in children at early stages of life. So that they would be able to channelize their thinking in a flexible manner while performing different tasks and will be able to solve problems by thinking out of the box. There are few ways to enhance these abilities which include meditation, yoga and other contemplative practices. A number of previous studies

have suggested that mindfulness meditation can enhance cognitive performance. Some evidence suggests positive effects of mindfulness meditation on cognitive flexibility (Moore & Malinowski; Moore et al., 2012).

3.0 Statement of the problem

Effect of Meditation & Physical Activity (MAP) Training on Cognitive Flexibility, Insight Problem Solving & Academic Achievement of Primary School Students

4.0 Variables of the study

Independent variable: Meditation & Physical Activity (MAP)Training

Dependent variable: Cognitive Flexibility, Insight Problem Solving & Academic Achievement

5.0 Operational Definition of Constructs

Meditation & Physical Activity (MAP) Training

MAP training is a novel intervention which includes combination of both meditation and physical activity training in order to train the mind as well as body.

Cognitive Flexibility

Cognitive flexibility, the readiness with which one can selectively switch between mental processes to generate appropriate behavioral responses.

Insight Problem Solving

The processes involved where the solution to the problem is not the result of a long thought process but it is the sudden occurrence of solution in the mind. This kind of problem solving technique is known as insight problem solving.

Academic Achievement:

Academic achievement refers to scores of the students achieved in the term test conducted in the school before and after the intervention.

6.0 Objectives of the study

- To study the effect of MAP training on cognitive flexibility of primary school students
  - **a)** To study the effect of chakra meditation on cognitive flexibility of primary school students
  - **b)** To study the effect of mantra meditation on cognitive flexibility of primary school students
  - **c)** To study the comparative effect of chakra meditation and mantra meditation on cognitive flexibility of primary school students
  - **d)** To study the comparative effect of MAP (chakra) and MAP (mantra) on cognitive flexibility of primary school students

- To study the effect of MAP training on insight problem solving of primary school students
  - **a)** To study the effect of chakra meditation on insight problem solving of primary school students
  - **b)** To study the effect of mantra meditation on insight problem solving of primary school students
  - **c)** To study the comparative effect of chakra meditation and mantra meditation on insight problem solving of primary school students
  - **d)** To study the comparative effect of MAP (chakra) and MAP (mantra) on insight problem solving of primary school students

- To study the effect of MAP training on academic achievement of primary school students
  - **a)** To study the effect of chakra meditation on academic achievement of primary school students
  - **b)** To study the effect of mantra meditation on academic achievement of primary school students

c) To study the comparative effect of chakra meditation and mantra meditation on academic achievement of primary school students

d) To study the comparative effect of MAP (chakra) and MAP (mantra) on academic achievement of primary school students

- To study the comparative effect of chakra meditation & MAP training (chakra meditation) on cognitive flexibility, insight problem solving & academic achievement of primary school students
- To study the comparative effect of mantra meditation & MAP training (mantra meditation) on cognitive flexibility, insight problem solving & academic achievement of primary school students

7.0 Hypothesis of the study

- There will be no significant effect of MAP training on cognitive flexibility of primary school students

a) There will be no significant effect of chakra meditation on cognitive flexibility of primary school students

b) There will be no significant effect of mantra meditation on cognitive flexibility of primary school students

c) There will be no significant comparative effect of chakra meditation & mantra meditation on cognitive flexibility of primary school students

d) There will be no significant comparative effect of MAP (chakra) and MAP (mantra) on cognitive flexibility of primary school students

- There will be no significant effect of MAP training on insight problem solving of primary school students

a) There will be no significant of chakra meditation on insight problem solving of primary school students

b) There will be no significant of mantra meditation on insight problem solving of primary school students

c) There will be no significant comparative effect of chakra meditation & mantra meditation on insight problem solving of primary school students

d) There will be no significant comparative effect of MAP (chakra) and MAP (mantra) on insight problem solving of primary school students

- There will be no significant effect of MAP training on academic achievement of primary School Students

a) There will be no significant effect of chakra meditation on academic achievement of primary school students

b) There will be no significant effect of mantra meditation on academic achievement of primary school students

c) There will be no significant comparative effect of chakra meditation & mantra meditation on academic achievement of primary school students

d) There will be no significant comparative effect of MAP (chakra) and MAP (mantra) on academic achievement of primary school students

- There will be no significant difference between the comparative effect of chakra meditation and MAP training (chakra meditation) on cognitive flexibility, insight problem solving & academic achievement of primary school students
- There will be no significant difference between the comparative effect of mantra meditation and MAP training (mantra meditation) on cognitive flexibility, insight problem solving & academic achievement of primary school students

8.0 Delimitations

- The participants will be from Agra region only.
- The schools will be selected affiliated to DEI board and CBSE education board only.

9.0 Research Design

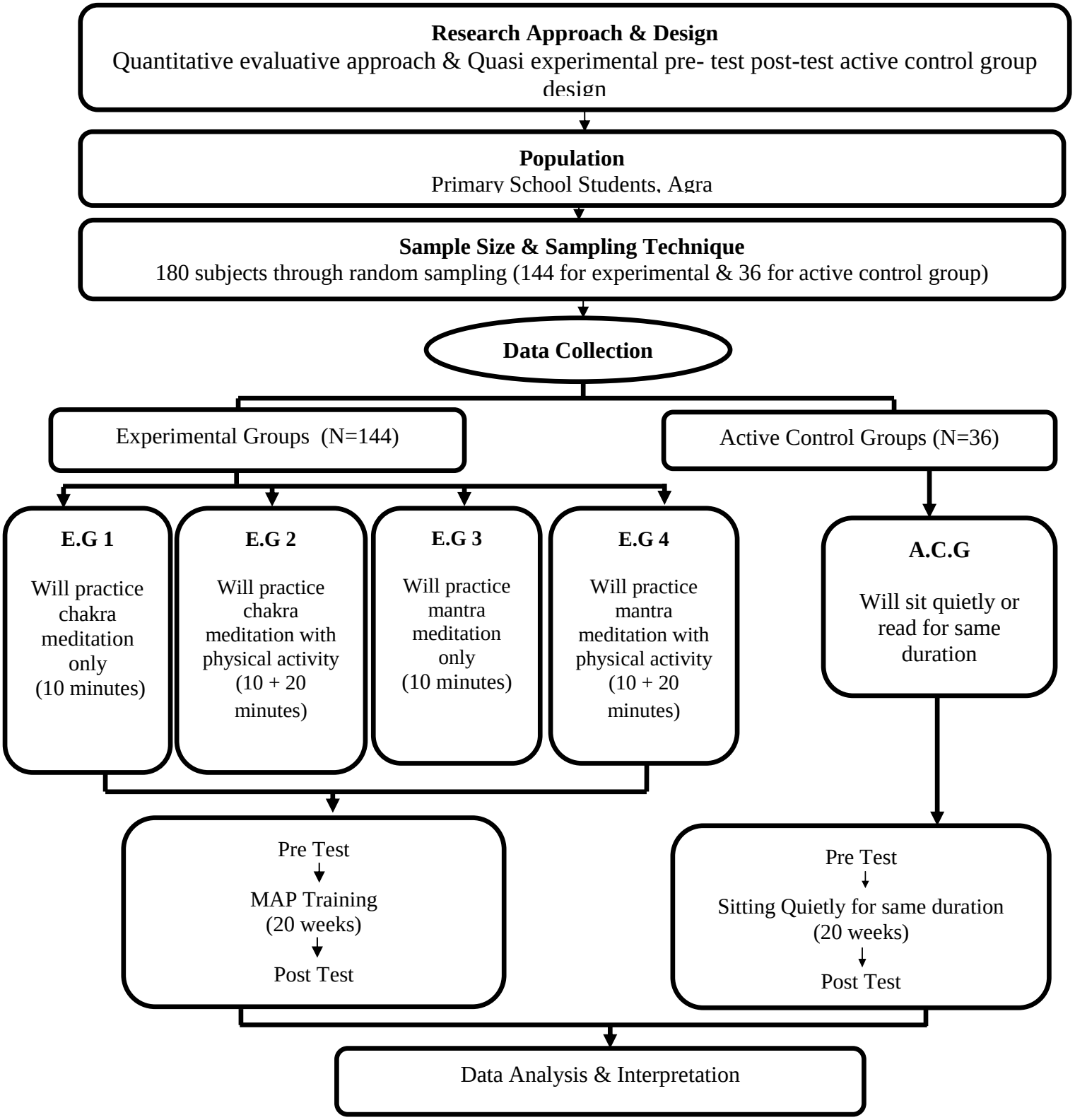
Research Approach & Design
Quantitative evaluative approach & Quasi experimental pre- test post-test active control group design
Population
Primary School Students, Agra
Sample Size & Sampling Technique
180 subjects through random sampling (144 for experimental & 36 for active control group)
Data Collection
Experimental Groups (N=144)
Active Control Groups (N=36)
E.G 1
Will practice chakra meditation only (10 minutes)
E.G 2
Will practice chakra meditation with physical activity (10 + 20 minutes)
E.G 3
Will practice mantra meditation only (10 minutes)
E.G 4
Will practice mantra meditation with physical activity (10 + 20 minutes)
A.C.G
Will sit quietly or read for same duration
Pre Test
MAP Training (20 weeks)
Post Test
Pre Test
Sitting Quietly for same duration (20 weeks)
Post Test
Data Analysis & Interpretation

Fig. 1: Research Design

9.1 Sampling Procedure

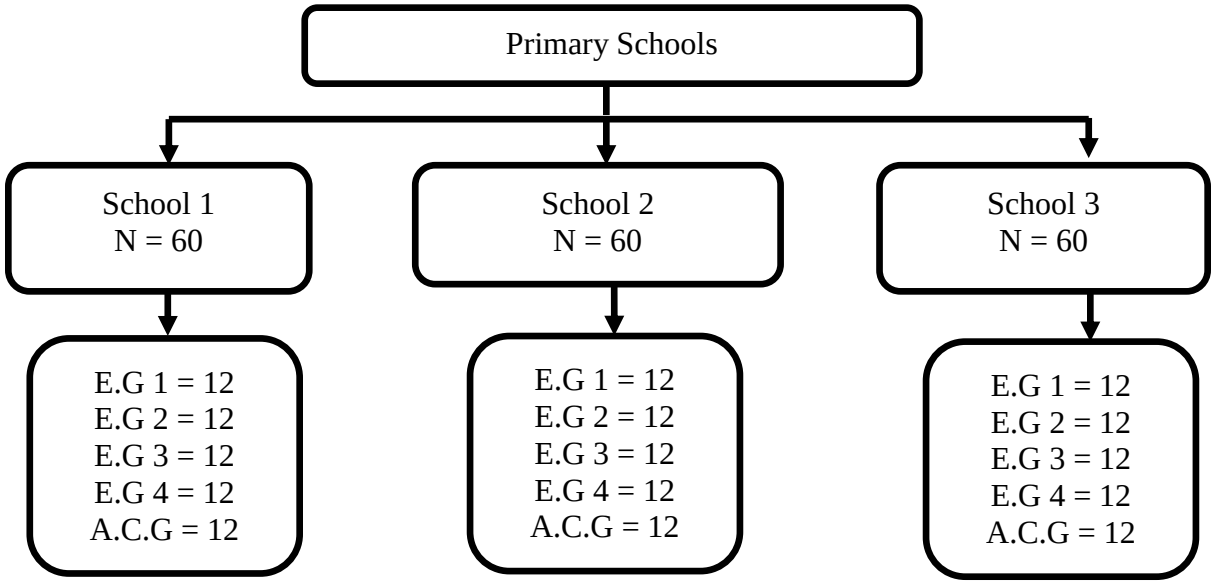

Fig 2: Sampling Procedure

10.0 Procedure of the study

One eighty students from three schools will be the participants for this study. Written consent will be sought from the school teachers and parents. Schools will be selected using purposive sampling. Selection of the 12 students in each group will be done through random sampling. A list will be prepared of participating students from classes II to V. 60 students (12 in each group – Experimental Group 1, Experimental group 2, experimental group 3, experimental group 4 and active control group) from each of three schools will be selected for the experiment based on the consent for the respective practice of experiment. Thus, total targeted sample will be 12(participants in each group)x5(no. of groups)x3(no. of schools) = 180. The sample size is extrapolated considering drop-outs or other similar unforeseen reasons.

The participants will be first assessed for baseline measures of cognitive flexibility and insight problem solving ability. The age range of the participants will vary from 7 to 10 years. MAP

training will be given for total five months, three days in a week for total 20 minutes (10 minutes- meditation, 10 minutes- physical activity) during assembly hours. The study groups will be divided into five groups i.e four experimental and one active control. Experimental groups will have equal number of students in four set of subjects. These groups will be matched on the basis of age and gender and baseline measures. Experimental Group 1 will include students who will practice only chakra meditation (based on repetition of syllable Ra-dha-Soa-Mi) by sitting silently for 10 minutes, three days in a week in the morning assembly hours. Experimental group 2 will include students who will practice chakra meditation for 10 minutes along with early morning physical activity training for 10 minutes, three days in a week in morning assembly hours. Experimental group 3 will include students who will practice only mantra meditation (a form of focused attention meditation) with gayatri mantra for 10 minutes, three days in a week in morning assembly hours. Experimental Group 4 will include students who will practice mantra meditation by repeating gayatri mantra for 10 minutes along with early morning physical activity training for 10 minutes, three days in a week. The participants of active control group will read for the same duration.

10.1 MAP Training Intervention

10.1.1 *Chakra meditation intervention*

Chakra meditation is a kind of meditation which is based on repetition of syllable Ra-dha-Soa-Mi. These syllables help in chakra activation in one's body. Ra creates effect on navel chakra, Dha creates effect on heart chakra, Soa creates effect on throat chakra and Mi creates effect on eyes chakra. It will be practiced for 10 minutes, three days in a week in the morning hours during school assembly.

10.1.2 *Mantra meditation intervention*

Mantra meditation is one of the oldest form of focused attention meditation. In this study gayatri mantra (Om Bhoor Bhuwah Swah, Tat Savitur Varenyam, Bhargo Devasya Dheemahi, Dhiyo Yo Nah Pra-chodayaat) will be practiced by students. It will be practiced for 10 minutes, three days in a week in the morning hours during school assembly.

10.1.3 *Physical activity training intervention*

Physical activity training will include number of exercises which will be repeated 16 times. It will be practiced for 10 minutes along prior to meditation practices. It will involve warm up exercises (marching in place & jogging in place), balancing exercises (hands & legs balancing, bending the knee & stretching it upwards), neck muscle strengthening exercises (neck stretching forward, backward, left & right), breathing exercises (with hands stretched out) and other exercises (hands stretching, arm stretching with bending elbows, shoulder stretching, rotating of hands clockwise & anti-clock wise, side jumps with and without clap, knee bending left and right).

11.0 Tools for the study

Cognitive Flexibility:	Number-Letter Task (Vandierendonck et al. 2010, Pashler 2000) / Shape Trail Test-Child Version (STT- CV) (Chan A. & Morgan S., 2018)
Insight Problem Solving:	Nine dot problem task (John Adair, 1969)
Academic Achievement:	Results of unit test will serve as the academic achievement scores

11.1.0 *Number - Letter Task*

In this task the participant will be presented a set of number and letter (7U, 5B) . In the first phase one has to categorize on the basis of number whether it is a odd or even. In the second phase one has to categorize on the basis of letter whether it is vowel or consonant.

11.2.0 *Shape trail test- child version*

In this test participants will be provided a sheet in which letters and numbers will be enclosed in two different kind of shapes (square and circle). The participants are required to make a trail by joining these shapes by following a proper order. Eg: A1, B2, C3

11.3.0 *Nine Dot Problem Task*

In this task the participants will be presented a picture of nine dots in form of a sqaure. They are required to connect those dots by joining them with straight and continuous lines without lifting the pen from the paper. This task can only be solved by drawing lines outside that shape of the square. This task is a classic tool that can be used to asses insight problem solving.

Indian reference of tools

The number letter task and nine dot problem task are performance tasks which are open ended, involve geometrical shapes, English alphabets, numbers and hence culture free. Therefore Indian reference is not required.

An Indian reference of Trail Making Test (Bhatia, T., Shriharsh, V., Adlakha, S., Bisht, V., Garg, K., & Deshpande, S. N. , 2007) was found from which the shape trail test has been emerged.

12.0 Statistics

Descriptive statistics: Mean, Median & Mode

Inferential statistics: One way ANOVA

13.0 Significance of the study

It is already a commonly held belief that short bursts of exercise can make all the difference for a child's concentration and academic performance throughout the school day. This is particularly true for primary-age children, who are undergoing a critical time for the development of their minds and bodies (Vickers,2017). It is well known that meditation helps in enhancing executive functions like sequencing, memory, and prioritizing which contribute to necessary skills for success in school and life and physical activity in school primes the brain for new learning (Ratey,n.d.). From an Ecological Model perspective schools are a key setting to promote PA in children, especially considering children spend as much as 60–70% of their waking hours at school and previous qualitative research with school stakeholders has identified the school as a key setting for improving health behaviors (Huberty,Dinkel, Coleman & Apenteng, 2012).

From the above remarks it is clear that both meditation and physical activity are complementary to each other. Meditation helps in improving overall brain health and physical activity prepares the body to perform several tasks. As there is growing body of research related to meditation and physical activity but still there are few researches which report the combined effect of both these practices together. Most of the researches regarding this kind of intervention are directed towards adults and old age people. Hence it is of utmost importance know whether these practices creates significant effect on cognitive flexibility, insight problem solving and academic achievement of primary school students. Overall it can be said that this research study will emerge out as a significant effort as it will be helpful in highlighting the importance of both mental and physical training for primary school children and its implication in educational scenario.

References

Armbruster DJN, et al. (2012) Prefrontal Cortical Mechanisms Underlying Individual Differences in Cognitive Flexibility and Stability. Journal of Cognitive Neuroscience. 2012;24:2385–2399

Ash, I. K., & Wiley, J. (2006). The nature of restructuring in insight: An individual-differences approach. Psychonomic Bulletin & Review, 13, 66-73.

Alderman B.L, Olson R.L, Brush C.J & Shors T.J (2016). MAP traning: combining meditation and aerobic exercise reduces depression and rumination while enhancing synchronized brain activity. Translational Psychiatry.

Alves, G. (2013, August). Freedom to be a Child: Why A Happy and Carefree Childhood Is Important. *Forbes India magazine.* Retrieved from http://www.forbesindia.com/article/recliner/freedom-to-be-a-child-why-a-happy-and-carefree-childhood-is-important/35865/1

Bosch, I.V.D. (2011). Meditation & the brain: Neurophsyiological Effects of Meditation. Radboud University, Nijmegan, The Netherlands.

Black DS, Milam J, Sussman S (2009) Sitting-Meditation Interventions Among Youth: A Review of Treatment Efficacy. Pediatrics 124: e532-541. 65.

Baerentsen KB, Stodkilde-Jørgensen H, Sommerlund B, Hartmann T, Damsgaard-Madsen J, Fosnaes M, Green AC. An investigation of brain processes supporting meditation. Cogn Process. 2010;11(1):57–84. doi: 10.1007/s10339-009-0342-3

Bhatta KV. (2004) 4th ed. South Canara: Kaitanje Prakashan, Shri Gayatri Mantra Rahasya

Cahn BR, Polich J. (2006) Meditation states and traits: EEG, ERP, and neuroimaging studies. Psychol Bull. [PubMed] [Cross Ref]

Chiesa A, Serretti A. (2009) Mindfulness-based stress reduction for stress management in healthy people: a review and meta-analysis. J Altern Complement Med. [PubMed] [Cross Ref]

Donnelly JE, Greene JL, Gibson CA, Smith BK, Washburn RA, Sullivan DK, et al., (2009) Physical Activity Across the Curriculum (PAAC): a randomized controlled trial to promote physical activity and diminish overweight and obesity in elementary school children. Prev Med;49(4):336–41. CrossRef PubMed

Draganski B, May A (2008) Training-induced structural changes in the adult human brain. Behavioural Brain Research 192: 137-142

Dina R. Dajani & Lucina Q. Uddin, (2015). Demystifying cognitive flexibility: Implications for clinical and developmental neuroscience. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5414037/#R1

Fisher, R. (2006). Still thinking: the case for meditation with children. Thinking Skills and Creativity, *v1 n2 p146-151*

Goldin PR, Gross JJ. (2010). Effects of mindfulness-based stress reduction (MBSR) on emotion regulation in social anxiety disorder. Emotion. 10(1):83. [PubMed][Cross Ref]

Harshananda S. (2010) 3rd ed. Chennai: Ramkrishna Math. Upanayana, Sandhya Vandana and Gayatri Mantra Japa

Hélie, H., & Sun, R. (2010). Incubation, insight, and creative problem solving: A unified theory and a connectionist model. Psychological Review, 117(3), 994–1024. Retrieved from http://dx.doi.org/10.1037/a0019532

Harne, Alexander, (2017). "Availability for Learning:Effects of Mindfulness Meditation on Student Cognitive Abilities" PCOM Psychology Dissertations. 410

Iris van den Bosch. (2011). Meditation and the Brain Neurophsyiological Effects of Meditation

Jones, G. (2003). Testing two cognitive theories of insight. Journal of Experimental Psychology: Learning, Memory, and Cognition, 29(5), 1017–1027. Retrieved from http://dx.doi.org/10.1037/0278-7393.29.5.1017

Jacobs TL, Epel ES, Lin J, Blackburn EH, Wolkowitz OM, Bridwell DA, Zanesco AP, Aichele SR, Sahdra BK, MacLean KA, King BG. (2011) Intensive meditation training, immune cell telomerase activity, and psychological mediators. Psychoneuroendocrinology. 36(5):664–681. [PubMed] [Cross Ref]

Jung-Beeman, M., Bowden, E. M., Haberman, J., Frymiare, J. L., Arambel-Liu, S., Greenblatt, R., Reber, P. J., & Kounios, J. (2004). Neural activity when people solve verbal problems with insight. PLoS Biology, 2(4), 500–510. Retrieved from http://dx.doi.org/10.1371/journal.pbio.0020097

Jha AP, Krompinger J, Baime MJ. (2007) Mindfulness training modifies subsystems of attention. Cogn Affect Behav Neurosci. [PubMed] [Cross Ref]

Kounios, J., & Jung-Beeman, M. (2009). The aha! moment: The cognitive neuroscience of insight. Current Directions in Psychological Science, 18, 4210–216. Retrieved from http://dx.doi.org/10.1111/j.1467-8721.2009.01638.x

Lutz A, Dunne JD, Davidson RJ (2007) Meditation and the Neuroscience of Consciousness: An Introduction. In: Zelazo PD, Moscovitch M, Thompson E, editors. The Cambridge Handbook of Consciousness. Cambridge: Cambridge University Press. pp. 497-550. 3.

Lutz A, Slagter HA, Dunne JD, Davidson RJ (2008) Attention regulation and monitoring in meditation. Trends in Cognitive Sciences 12: 163-169

Lees C, Hopkins J., (2013) Effect of Aerobic Exercise on Cognition, Academic Achievement, and Psychosocial Function in Children: A Systematic Review of Randomized Control Trials. Prev Chronic Diseases ;10:130010. Retrieved from http://dx.doi.org/10.5888/pcd10.130010

Luders E, Clark K, Narr KL, Toga AW. (2011) Enhanced brain connectivity in long-term meditation practitioners. NeuroImage. 2011;57(4) [PubMed] [Cross Ref]

Misra B.H., (2009) Discourses on radhasoami faith, 73-77.

MacLean KA, Ferrer E, Aichele SR, Bridwell DA, Zanesco AP, Jacobs TL, King BG, Rosenberg EL, Sahdra BK, Shaver PR, Wallace BA. (2010) Intensive meditation training improves perceptual discrimination and sustained attention. Psychol Sci. 21(6):829–839. [PubMed] [Cross Ref]

Nidich S, Mjasiri S, Nidich R, Rainforth M, Grant J, Valosek L, Chang W, Zigler RL. (2011) Academic achievement and transcendental meditation: a study with at-risk urban middle school students.

Population-based approaches to childhood obesity prevention. World Health Organization; 2012. Retrieved from http://www.who.int/dietphysicalactivity/childhood/WHO_new_childhoodobesity_PREVENTION

Pagnoni G, Cekic M. (2007) Age effects on gray matter volume and attentional performance in Zen meditation. Neurobiol Aging. 28(10):1623–1627.[PubMed] [Cross Ref]

Qiu, J., Li, H., Jou, J., Liu, Y., Luo, Y., Feng, T., Wu, Z., & Zhang, Q. (2010). Neural correlates of the “aha” experiences: Evidence from an fMRI study of insight problem solving. Cortex, 46(3), 397–403. Retrieved from http://dx.doi.org/10.1016/j.cortex.2009.06.006

Rao K. R. (2011). Applied yoga psychology: studies of neurophysiology of meditation. J. Consciousness Studies 18, 161–198

Raffone A, Srinivasan N (2010) The exploration of meditation in the neuroscience of attention and consciousness. Cognitive Processing 11: 1-7. 4

Roberts KC, Shields M, de Groh M, Aziz A, Gilbert J., (2012). Overweight and obesity in children and adolescents: results from the 2009 to 2011 Canadian Health Measures Survey. 82-003-X Vol. 23 No. 3. Statistics Canada.

Robins CJ, Keng SL, Ekblad AG, Brantley JG. (2012) Effects of mindfulness-based stress reduction on emotional experience and expression: a randomized controlled trial. J Clin Psychol. 68(1):117–131. [PubMed] [Cross Ref]

Rubia K. (2009) The neurobiology of meditation and its clinical effectiveness in psychiatric disorders. Biol Psychol. 82(1):1–11. [PubMed] [Cross Ref]

Shors T.J, Chang H.Y.M, Millon E.M (2018). MAP Training: Meditation plus Aeroic Execrcie lessens trauma of sexual violence more than any either activity alone. Frontiers Neuroscience

Thomas AG, Dennis A, Bandettini PA, Joahsen-Berg H., (2012). The effects of aerobic activity on brain structure. Front Psychol, 3:86. CrossRef PubMed

Tuckman BW, Hinkle JS. (1986) An experimental study of the physical and psychological effects of aerobic exercise on schoolchildren. Health Psychol;5(3):197–207. CrossRef PubMed

Tang YY, Tang R, Jiang C, Posner MI. (2014) Short-term meditation intervention improves self-regulation and academic performance. J Child Adolesc Behav.2:154.

Vilgis V, et al. (2015) Executive function and attention in children and adolescents with depressive disorders: a systematic review. Eur Child Adolesc Psychiatry. 2015

William H. Batchelder and Gregory E. Alexander. (2012). Insight Problem Solving: A Critical Examination of the Possibility of Formal Theory